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Toxicological and Epidemiological Clues from the Characterization of the 1952 London Smog Fine Particulate Matter in Archival Autopsy Lung Tissues.

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Abbreviations:

COPD - chronic obstructive pulmonary disease

EDX - energy dispersive X-ray analysis

МΦ - macrophage

NMMAPS - National Morbidity and Mortality Air Pollution Study

SEM - scanning electron microscopy

BE – backscattered electron

RLH – Royal London Hospital

H&E - Hematoxylin and Eosin

Abstract

Exposure to atmospheric fine particulate matter (PM), even at low ambient concentrations, has clearly been linked to increases in mortality and morbidity. A 10 μg m^{-3} increase in PM_{10} (<10 μm) has been found to produce a 0.5% increase in daily mortality. The mechanism of action is a source of debate, although recent attention has focused on the cardiac effects of PM exposures. Likewise, several possible etiologic agents have been implicated, including ultrafine PM (≤ 100 nm), metals, and the acid components; yet the responsible constituent remains undetermined. During the catastrophic PM exposure episode in London in December 1952, some 4,000 excess deaths occurred at the height of the event. The extreme mortality during that episode and the preservation of archival autopsy tissues allow us the unique opportunity to report on the form and composition of December, 1952 London PM *in situ* in tissues from persons known to have died from the smog exposure. As absolute increases in mortality with current levels of PM in Western Europe and North America are low, analogous tissues are unlikely to be contemporaneously available. Taking a lung compartment (airway, airspace, interstitium, and lymph node) approach, we differentiated exposures contemporary with death from those of earlier origin. Electron microscopic analyses revealed the dominance of retained soot and a surfeit of other particle types. A variety of metal bearing particle types were found in all compartments, but Pb, Zn, and SnZn types appeared the least bio-persistent. The results support the acute toxicological importance of metal and ultrafine carbonaceous PM.